人工智能巅峰5大技术研发创新土婆 (Top 5 Technological Innovations in Artificial Intelligence)
Inbox
wsadm_2019
10:40 AM (22 minutes ago)
to me
Translated: Chinese
English
Translate can make mistakes, so verify translations
Five Breakthroughs and Innovative Core Technologies in Artificial Intelligence2026v1.2
Five Breakthrough Innovations in Core Technologies of Artificial Intelligence: ① Biomimetic High-Intelligence Computers: Significant transformation and upgrading of the computer's main structure, adding major components such as filtering, purification, and polymerization devices, system modules, memory, association, thinking, verification, reasoning ability, system consciousness perception, and five cognitive feedback control system modules, including natural language, logic language, mathematical logic language, figurative language decoders, analyzers, filters, encoders, etc. ② Higher Mathematics and Physics: Calculus, number theory, graph theory, complex functions and integral transforms, making program code and its parameters more rigorous, realistic, detailed, optimized, generalized, and deepened, contributing to the development and transformation of biomimetic simulation and neural network autonomous consciousness. ③ In addition to computing power, algorithms, and databases, biological neural network chips are also crucial. ④ Artificial intelligence technology research and development involves numerous disciplines and specialties, requiring more technological innovation. Its development trend is comprehensive integration, neural network autonomous consciousness, computer device innovation, ultra-large-scale integrated circuit technology chip innovation, software and hardware synergy integration, and the emergence of neural network autonomous consciousness. ⑤ Other auxiliary systems, such as real-time response capabilities, heat protection and noise reduction, system behavior, intelligent agent mode, and world modeling. Currently, technological research and innovation in artificial intelligence (AI) is undergoing a profound paradigm shift, the core of which is moving from the "perception and generation" of the digital world to the "cognition and planning" of the physical world. This is

not only a leap in capabilities, but also foreshadows several key trends in future development.

A fundamental shift in technological paradigms

The underlying logic of AI development is undergoing a critical change, shifting from "predicting the next word" (Next-Token Prediction) to "predicting the next state of the world" (Next-State Prediction, NSP).

* From Language to the World: This means that AI is no longer just learning and imitating human language expressions, but is beginning to try to understand and model the underlying laws, spatiotemporal continuity, and causal relationships of the physical world.
* The Rise of World Models: As the core of achieving this goal, world models can understand and predict changes in dynamic environments. They will become the consensus direction for achieving Artificial General Intelligence (AGI), providing a decision-making basis for scenarios such as autonomous driving and robotics that require deep interaction with the physical world.

Three core trends for future development

Based on the aforementioned paradigm shift, the future development of AI exhibits three interconnected core trends.

1. The Evolution of Intelligent Forms: From "Solving Problems" to "Getting Things Done"

AI's application capabilities are shifting from solving closed-ended problems with standard answers to handling "fuzzy tasks"—open-world problems where results are difficult to verify directly. This is giving rise to two main forms of intelligence:

* The AI Agent Explosion: AI is evolving from a tool that passively executes instructions into a "partner" capable of autonomously planning, calling upon tools, and continuously executing complex tasks. By connecting large models with external tools, AI agents have achieved a leap from dialogue to decision-making and execution, becoming a new form of application for large models and potentially replacing some apps as new traffic entry points.
* Embodied AI Deployment: AI is deeply integrated with the robot itself, sensors, and control systems, forming a closed-loop capability of "perception-decision-execution." Embodied AI is moving beyond laboratory demonstrations and entering the stage of industrial screening and deployment. Humanoid robots, intelligent robotic arms, and other technologies will play a role in real-world scenarios such as industrial manufacturing, warehousing and logistics, and home services.

2. The Exploration of Ultimate Capabilities: AI for Science
Scientific discoveries are seen as the ultimate test of AI intelligence. The role of AI in scientific research is evolving from an auxiliary tool to an "AI scientist" capable of autonomous scientific discovery.
* Disrupting the scientific research paradigm: By combining basic scientific models with automated laboratories, AI can independently complete the entire process from hypothesis generation and experimental verification to theoretical summarization, which will greatly accelerate the innovation cycle in fields such as new material discovery and drug development.
* The path to Achievement of AGI: This ability to reason about long-range tasks and to self-evolve is a key feature of the artificial general intelligence (AGI) that the world is pursuing.
3. Integration of technical approaches: general-specific integration and multi-agent collaboration
The technological development path of AI is moving from the binary opposition of "specialized" and "general-purpose" to "integration of specialized and general-purpose technologies".
* General-Specialized Fusion: Future large-scale models will combine the broad knowledge of general models with the deep capabilities of specialized models, enabling them to handle complex cross-domain problems as well as reach expert levels in specific vertical fields.
Multi-Agent Systems: Solving complex problems relies on the collaborative efforts of multiple agents. With the standardization of communication protocols, agents will form collaborative networks similar to "teams," becoming critical infrastructure in complex workflows such as scientific research and industrial process optimization.
Key supporting technologies and challenges
To achieve the aforementioned trends, a range of supporting technologies are also developing rapidly, and are facing corresponding challenges.
Key advancements in supporting fields face challenges: Computing power and data inference optimization: Significantly reducing inference costs through algorithmic and hardware innovations enables the deployment of high-performance models at the edge. Synthetic data: High-quality synthetic data generated from world models and other sources is becoming the core fuel for solving the problem of real-world data depletion. Computing power bottlenecks: Large-scale applications place extremely high demands on computing power, highlighting cost and energy consumption issues.

Data barriers: The phenomenon of high-quality industry data silos is severe, and concerns about ownership and security exist regarding their circulation and sharing.
Explanatory Security and Governance Mechanisms: Research delves into the internal mechanisms of models to understand and prevent advanced risks in AI, such as "systemic deception." Full-Stack Security: Building end-to-end security mechanisms for applications like intelligent agents, including access control and operational auditing. Security Risks: Data poisoning, malicious plugins, and uncontrolled access threaten the reliability of AI systems. Trust Crisis: Insufficient product maturity and algorithmic bias affect user trust in AI products.
The "AI+" initiative for industrial integration: Policy-driven deep integration of AI with the real economy, fostering new business models in key industries such as manufacturing and healthcare. Implementation challenges: Highly differentiated industry scenarios and insufficient understanding of specialized knowledge in AI products hinder scalable replication. Business models: Most companies still operate on a project-based model, and sustainable profit models are not yet mature.
Please translate for me: "Analysis of the Five Core Technologies that Breakthrough in Artificial Intelligence"
As artificial intelligence (AI) technology enters a new stage of development, a series of disruptive core technologies are accelerating their breakthroughs, collectively forming the key support for AI's leap from "weak intelligence" to "strong intelligence." These technologies innovate around five dimensions: computer architecture, basic science, core hardware, interdisciplinary integration, and auxiliary systems, forming a "five-breakthrough core technology system" that drives the upgrading and capability leap of the AI industry, outlining a clear technological path for the future development of AI.
I. Biomimetic High-Intelligence Computers: Reconstructing the Hardware Foundation of Artificial Intelligence
Biomimetic high-intelligence computers represent a core innovation that breaks through the limitations of the traditional von Neumann architecture. Their core value lies in achieving a fundamental transformation from a "computing tool" to a "brain-like intelligent agent" through a disruptive modification of the computer's main structure. Traditional computers, centered on data processing, struggle to simulate the advanced cognitive functions of the human brain, such as memory, association, and reasoning. Biomimetic

high-intelligence computers, however, overcome this limitation by adding multiple key components and system modules.

At the hardware level, this technology focuses on the research and development and integration of filtering, purification, and aggregation device system modules. Through high-precision screening, purification, and aggregation of core components, it improves the stability of hardware operation and information processing efficiency, providing a reliable physical foundation for complex intelligent computing. In terms of functional modules, it constructs a memory-associative thinking verification and reasoning ability system and a consciousness perception and cognitive feedback control system module. The former simulates the memory storage and associative thinking mechanisms of the human brain, enabling deep association and autonomous retrieval of information; the latter establishes a closed-loop cognitive system of "perception-analysis-decision-feedback," allowing the computer to dynamically adjust its operating logic and decision-making direction based on external input and internal calculation results.

Furthermore, the integration of core components such as decoders, analyzers, filters, and encoders for natural language, logical language, mathematical logic language, and figurative language is crucial for biomimetic high-intelligence computers to achieve multimodal information interaction and deep understanding. These components enable precise bidirectional conversion between human language forms and machine code, allowing computers not only to process mathematical data but also to understand core human cognitive forms such as natural language, logical reasoning, and figurative thinking, thus laying a solid foundation for the emergence of self-awareness through the integration of hardware and software.

II. Advanced Mathematics and Physics: Laying a Solid Foundation for the Underlying Logic of Artificial Intelligence

Profound innovations in higher mathematics and physics are the core support for the transformation of artificial intelligence technology from "experience-driven" to "theory-driven." In the field of mathematics, theoretical breakthroughs and in-depth applications in fundamental disciplines such as calculus, number theory, graph theory, complex functions, and integral transforms provide a rigorous logical framework and computational tools for artificial intelligence. The refined application of calculus allows the training and optimization of neural networks to accurately characterize the continuous changing relationships between variables, improving the accuracy of model fitting; innovative achievements in number theory

provide underlying support for data encryption and algorithm complexity optimization, ensuring the security and operational efficiency of artificial intelligence systems; graph theory provides core modeling methods for tasks such as knowledge graph construction, path planning, and relational reasoning, enabling artificial intelligence to more clearly understand the logical connections between entities; and the expanded applications of complex functions and integral transforms further enrich the means of signal processing and model transformation, enhancing the processing capabilities of multimodal data.

Meanwhile, with the support of mathematical and physical theories, the program code and parameter system of artificial intelligence have achieved breakthroughs in rigor, realism, truth-seeking, refinement, optimization, generalization, and deepening. By deeply integrating physical laws and mathematical models into code design, the generalization ability of artificial intelligence algorithms has been significantly enhanced. They are no longer limited to training data in specific scenarios but can adapt to more complex and dynamic real-world environments. The refined optimization of parameters allows models to achieve an optimal balance between accuracy, speed, and energy consumption, providing a theoretical basis for the iterative development of biomimetic simulation and neural networks. Crucially, these breakthroughs in fundamental disciplines provide logical support for the emergence of autonomous consciousness in neural networks—only when the operational logic of artificial intelligence is built upon a rigorous and self-consistent mathematical and physical system can it potentially transform from "data fitting" to "autonomous thinking and proactive cognition," propelling artificial intelligence towards a higher level of intelligence.

III. Biological Neural Network Chips: Breaking Through the Core Bottlenecks of Computing Power and Intelligence

With computing power, algorithms, and databases becoming standard elements in the development of artificial intelligence, biological neural network chips, as a novel core technology, have become an important tool for breaking through the performance bottleneck of artificial intelligence. Traditional chips, based on binary logic operations, can support large-scale data processing, but they are difficult to simulate the parallel processing, adaptive learning, and low-power characteristics of biological neurons. The emergence of biological neural network chips precisely fills this core shortcoming.

The core innovation of biological neural network chips lies in their

borrowing of the neuronal connection structure and signal transmission mechanism of the biological brain. By simulating the plasticity of synapses and the excitation and inhibition characteristics of neurons, they achieve brain-like parallel computing and information processing. Compared with traditional chips, they have three core advantages: First, ultra-low power consumption. The energy consumption of signal transmission in biological neurons is far lower than that of logic gate operations in traditional chips, effectively solving the high energy consumption problem in the operation of large-scale artificial intelligence models. Second, ultra-high parallelism. The neuronal array inside the chip can process massive amounts of information simultaneously, significantly improving computing speed and response efficiency. Third, self-learning capability. Based on the dynamic adjustment mechanism of synaptic weights, the chip can autonomously optimize its computational logic according to environmental feedback, just like a biological brain, without relying on repeated external training.

As an important supplement to the computing power system, the biological neural network chip does not replace traditional computing hardware, but rather complements and synergizes with general-purpose computing power. In complex scenarios, the biological neural network chip can handle core tasks such as brain-like cognition and real-time decision-making, while traditional computing power undertakes basic tasks such as large-scale data processing and model training. The integration of the two constructs a hybrid computing power system of "general-purpose computing power + brain-like dedicated chip", providing core hardware-level support for the emergence of autonomous consciousness in artificial intelligence and the execution of complex intelligent tasks.

IV. Interdisciplinary Integration and Technological Iteration: Building a Diverse Innovation Ecosystem for Artificial Intelligence

The research and iteration of artificial intelligence technology is not a solo performance by a single discipline, but rather the product of deep integration among numerous disciplines such as mathematics, physics, computer science, biology, neuroscience, linguistics, and materials science. Every technological breakthrough relies on interdisciplinary collaborative innovation: findings in neuroanatomy in biology provide biological prototypes for the design of biomimetic computers; novel semiconductors and nanomaterials in materials science support the hardware manufacturing of biological neural network chips; pragmatic theories in linguistics optimize the decoding and encoding logic of natural language processing; and

research on cognitive mechanisms in neuroscience provides a theoretical basis for exploring the autonomous consciousness of neural networks.

Therefore, the core demand for innovation in artificial intelligence technology lies in breaking down disciplinary barriers and promoting the cross-integration and practical application of achievements from multiple fields. From a development trend perspective, artificial intelligence is exhibiting five core directions: First, comprehensive integration, consolidating various core technologies, multimodal data, and interdisciplinary tools into a unified intelligent system to achieve intelligent collaboration throughout the entire process; second, the autonomous consciousness of neural networks, focusing on the cognitive mechanisms, self-perception, and proactive decision-making of neural networks to propel artificial intelligence from "passive execution" to "autonomous thinking"; third, the innovation of computer devices, continuously breaking through the physical limits of traditional devices and developing new biomimetic and quantum devices to support hardware upgrades; fourth, the innovation of ultra-large-scale integrated circuit (ULSI) technology chips, creating high-end chips adapted to large-scale artificial intelligence models by optimizing chip integration, computing power density, and power consumption ratio; and fifth, the synergistic integration of software and hardware, breaking the independent development model of hardware architecture and software algorithms, allowing algorithm design to adapt to hardware characteristics, and hardware upgrades to support algorithm innovation, forming a virtuous cycle of "hardware-software" iteration. The advancement of these five trends is essentially the continuous deepening of interdisciplinary innovation and the core driving force for artificial intelligence to reach its peak.

V. Support System Upgrade: Enabling Efficient and Stable Operation of Artificial Intelligence

In addition to the four core technologies, a series of innovative upgrades to supporting systems are important supports for ensuring the efficient, stable, and safe operation of artificial intelligence, together forming a complete closed loop of the artificial intelligence technology system.

In terms of performance assurance, the real-time response capability system optimizes the algorithm response logic and hardware transmission efficiency to achieve rapid processing and decision-making of real-time data, meeting the needs of scenarios with extremely high timeliness requirements such as autonomous

driving, industrial control, and emergency response. The heat and noise pollution prevention system addresses the heat and electromagnetic noise generated by the high power consumption of the chip by using new heat dissipation materials, noise suppression algorithms, and hardware optimization design to ensure stable operation and data processing accuracy.

At the functional expansion level, the development of behavioral, intelligent, and modal systems enables artificial intelligence to upgrade from single-modal information processing (such as text-only or voice-only) to multi-modal fusion (collaborative understanding of text, images, voice, and video), while possessing the intelligent ability to autonomously plan behavior and dynamically adjust strategies, adapting to more complex real-world application scenarios. The world modeling system, by constructing an abstract cognitive model of the real world, enables artificial intelligence to understand physical laws, social rules, and environmental logic, achieving reasoning and prediction of unknown scenarios, and significantly improving the rationality and accuracy of its autonomous decision-making.

These auxiliary systems, seemingly "supporting components," are in fact the "cornerstone guarantee" for the practical application of core artificial intelligence technologies. Only with a comprehensive improvement in capabilities such as immediate response, stable operation, multimodal adaptation, and global cognition can core technologies such as biomimetic high-intelligence computers and biological neural network chips truly realize their value, propelling artificial intelligence from the laboratory to all walks of life, and ultimately achieving a deep integration of intelligent technology with real-world needs.

In summary, breakthroughs in artificial intelligence do not rely on a single technological breakthrough, but rather on the synergistic evolution and mutual support of five core technological systems. Biomimetic high-intelligence computers reconstruct the hardware foundation; advanced mathematics and physics solidify the logical foundation; biological neural network chips break through computing power bottlenecks; interdisciplinary integration and technological iteration expand the boundaries of innovation; and auxiliary system upgrades ensure stable operation—these five technologies work together to continuously drive artificial intelligence towards greater intelligence, autonomy, and practicality, ushering in a new era for AI technology.

Analysis of the Five Core Breakthrough Technologies at the Peak of

Artificial Intelligence

As artificial intelligence enters a brand-new stage of development, a series of disruptive core technologies are accelerating breakthroughs, which together form the key support for AI to leap from "weak AI" to "strong AI". These technologies are innovated around five dimensions: computer architecture, basic science, core hardware, interdisciplinary integration and auxiliary systems, forming the "Five Breakthrough Core Technology System" that drives the upgrading of the AI industry and the leap of its capabilities, and outlines a clear technical path for the future development of artificial intelligence.

I. Bio-Inspired High-Intelligence Computer: Reconstructing the Hardware Foundation of Artificial Intelligence

The bio-inspired high-intelligence computer is a core innovation that breaks through the bottleneck of the traditional von Neumann architecture. Its core value lies in realizing the essential transformation from a "computing tool" to a "brain-like intelligent agent" through the subversive transformation of the main computer structure. Traditional computers focus on data processing and are difficult to simulate advanced cognitive functions of the human brain such as memory, association and reasoning, while the bio-inspired high-intelligence computer breaks this shackle by adding multiple key components and system modules.

At the hardware level, this technology focuses on the research and development and integration of the filtering, purification and aggregation device system module. Through high-precision screening, purification and aggregation of core components, it improves the stability of hardware operation and information processing efficiency, providing a reliable physical foundation for complex intelligent computing. In terms of functional modules, it constructs a memory, association, thinking, verification, checking and reasoning system and a five-cognitive feedback control system module for consciousness and perception. The former simulates the memory storage and associative thinking mechanism of the human brain to realize deep correlation and independent invocation of information; the latter builds a closed-loop cognitive system of "perception-analysis-decision-feedback", enabling the computer to dynamically adjust its operation logic and decision-making direction according to external input and internal computing results.

In addition, the integration of core devices such as decoders, analyzers, filters and encoders for natural language, logical language, mathematical logic language and figurative language is

the key for bio-inspired high-intelligence computers to realize multi-modal information interaction and in-depth understanding. These devices enable accurate two-way conversion between human language forms and machine codes, allowing computers to not only process mathematical data, but also understand core cognitive forms of humans such as natural language, logical reasoning and figurative thinking, laying a solid foundation for the integration of hardware and software for the emergence of autonomous consciousness.

II. Advanced Mathematics and Physics: Consolidating the Underlying Logical Foundation of Artificial Intelligence

In-depth innovations in advanced mathematics and physics are the core support for the transformation of artificial intelligence from "empirically driven" to "theoretically driven". In the field of mathematics, theoretical breakthroughs and in-depth applications of basic disciplines such as calculus, number theory, graph theory, complex functions and integral transforms provide a rigorous logical framework and computing tools for artificial intelligence. achievements in number theory provide underlying support for data encryption and algorithm complexity optimization, ensuring the security and operation efficiency of AI systems; graph theory provides core modeling methods for tasks such as knowledge graph construction, path planning and relational reasoning, enabling AI to better understand the correlation logic between entities; the expanded application of complex functions and integral transforms further enriches the means of signal processing and model transformation, enhancing the processing capability of multi-modal data.

Meanwhile, empowered by mathematical and physical theories, the program codes and parameter systems of artificial intelligence have achieved breakthroughs in rigor, pragmatism, truth-seeking, refinement, optimization, generalization and deepening. By deeply integrating physical laws and mathematical models into code design, the generalization ability of AI algorithms has been significantly enhanced, no longer limited to training data in specific scenarios, but able to adapt to more complex and dynamic real-world environments. The refined optimization of parameters achieves an optimal balance among model accuracy, consumption and energy consumption, providing a speed Theoretical basis for the iterative development of bionic simulation and neural networks. Most importantly, breakthroughs in these basic disciplines provide logical support for the emergence of autonomous consciousness in neural

networks. Only when the computing logic of AI is built on a rigorous and self-consistent mathematical and physical system can it transform from "data fitting" to "independent thinking and active cognition", promoting the evolution of AI to a higher-level intelligent form.

III. Biological Neural Network Chip: Breaking Through the Core Bottleneck of Computing Power and Intelligence

At a time when computing power, algorithms and databases have become conventional elements of AI development, the biological neural network chip, as a new core key technology, has become an important grip to break through the performance bottleneck of artificial intelligence. Traditional chips center on binary logical operations; although they can support large-scale data processing, they are difficult to simulate the parallel processing, adaptive learning and low-power consumption characteristics of biological neurons. The emergence of biological neural network chips exactly makes up for this core shortcoming.

The core innovation of biological neural network chips lies in drawing on the neuron connection structure and signal transmission mechanism of the biological brain. By simulating the plasticity of synapses and the excitatory and inhibitory characteristics of neurons, it realizes brain-like parallel computing and information processing. Compared with traditional chips, it has three core advantages: first, ultra-low power consumption—the energy consumption of signal transmission in biological neurons is far lower than that of logic gate operations in traditional chips, effectively solving the high energy consumption problem in the operation of large AI models; second, ultra-high parallelism—the neuron array inside the chip can process massive amounts of information simultaneously, greatly improving computing speed and response efficiency; third, autonomous learning ability—based on the dynamic adjustment mechanism of synaptic weights, the chip can independently optimize computing logic according to environmental feedback like a biological brain, without relying on repeated external training.

As an important supplement to the computing power system, biological neural network chips do not replace traditional computing hardware, but form synergy and complementarity with general computing power. In complex scenarios, biological neural network chips can undertake core tasks such as brain-like cognition and real-time decision-making, while traditional computing power handles basic work such as large-scale data processing and model training.

the execution of complex intelligent tasks in artificial intelligence.

IV. Interdisciplinary Integration and Technological Iteration: Building a Diversified Innovation Ecosystem for Artificial Intelligence

The research and development and iteration of artificial intelligence technology are not a solo show of a single discipline, but a product of the in-depth integration of numerous disciplines and majors, including mathematics, physics, computer science, biology, neuroscience, linguistics and materials science. Every technological breakthrough is inseparable from interdisciplinary collaborative innovation: neuroanatomical achievements in biology provide biological prototypes for the design of bio-inspired computers; new semiconductors and nanomaterials in materials science support the hardware manufacturing of biological neural network chips; pragmatic theories in linguistics optimize the decoding and encoding logic of natural language processing; research on cognitive mechanisms in neuroscience provides a theoretical basis for exploring autonomous consciousness in neural networks. Therefore, the core demand for AI technological innovation is to break disciplinary barriers and promote the cross-integration and application of multi-field achievements. From the perspective of development trends, artificial intelligence is presenting five core directions: first, comprehensive integration—integrating various core technologies, multi-modal data and interdisciplinary tools into an integrated intelligent system to realize full-process intelligent collaboration; second, neural network autonomization—focusing on research on the cognitive mechanism, self-perception and active decision-making of neural networks, promoting AI to leap from "passive execution" to "independent thinking"; third, computer component innovation—continuously breaking through the physical limits of traditional components, developing new bionic and quantum devices to support hardware upgrading; fourth, ultra-large-scale integrated circuit chip innovation—optimizing chip integration, computing power density and power consumption ratio to create high-end chips adapted to large AI models; fifth, software-hardware collaborative integration—breaking the independent development model of hardware architecture and software algorithms, making algorithm design adapt to hardware characteristics and hardware upgrading support algorithm innovation, forming a benign ecosystem of two-way iteration of "hardware-software". The advancement of these five trends is essentially the continuous deepening of interdisciplinary innovation, and also the core driving force for AI to reach its peak.

V. Upgrading of Auxiliary Systems: Empowering Efficient and Stable Operation of Artificial Intelligence

In addition to the four core key technologies, the innovative upgrading of a series of supporting auxiliary systems is an important support to ensure the efficient, stable and safe operation of artificial intelligence, jointly forming a complete closed loop of the AI technology system.

At the performance guarantee level, the real-time response capability system realizes rapid processing and decision-making of real-time data by optimizing algorithm response logic and hardware transmission efficiency, meeting the highly time-sensitive scenario requirements such as autonomous driving, industrial control and emergency response. The heat dissipation and noise pollution reduction system addresses the heat and electromagnetic noise generated by high-power chip operation through new heat dissipation materials, noise suppression algorithms and hardware optimization design, ensuring stable system operation and data processing accuracy.

At the function expansion level, the research and development of system behavioral, intelligent and modal systems enables AI to upgrade from single-modal information processing (eg, only text or voice) to multi-modal fusion (collaborative understanding of text, images, voice and video), while possessing the intelligent ability of independently planning behaviors and dynamically adjusting strategies to adapt to more complex real-world scenarios. The world modeling system constructs an abstract cognitive model of the real world, enabling AI to understand physical laws, social rules and environmental logic, realize reasoning and prediction of unknown scenarios, and greatly improve the rationality and accuracy of its autonomous decision-making.

These auxiliary systems may seem like "supporting links", but they are actually the "cornerstone" for the application of AI core technologies. Only with the comprehensive improvement of capabilities such as real-time response, stable operation, multi-modal adaptation and world cognition can core technologies such as bio-inspired high-intelligence computers and biological neural network chips truly exert their value, promoting AI from laboratories to all industries, and finally realizing the deep integration of intelligent technology and real needs.

In summary, the peak breakthrough of artificial intelligence does not rely on a single technological point breakthrough, but the coordinated evolution and mutual support of the five core technology

systems. Bio-inspired high-intelligence computers reconstruct the hardware foundation, advanced mathematics and physics consolidate the logical foundation, biological neural network chips break through the computing power bottleneck, interdisciplinary integration and technological iteration expand the innovation boundary, and auxiliary system upgrading ensures stable operation. The joint force of these five technologies will continue to promote artificial intelligence to develop in a more intelligent, autonomous and practical direction, opening a new era of artificial intelligence technology.